GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF RESEARCH ADMINISTRATION

RESEARCH PROJECT INITIATION

Date: March 27, 1975

Project Title: Georgia Tech Air Quality Control Training Program

Project No: E-19-546

Principal Investigator: Dr. Clyde Orr

Sponsor: Environmental Protection Agency

Agreement Period: From March 1, 1975 Until February 28, 1976

Type Agreement: Grant No. T900499-03-1

Amount: $51,039 (EPA)
15,412 (GIT) E-19-214
$66,451 Total

Reports Required: Interim Progress Report with application for continuation (or Final Report if project is not to be continued)

Sponsor Contact Person (s): Mr. B. J. Steigerwald
Extramural Programs Branch
Office of Manpower Development
Office of Air Programs
Environmental Protection Agency
Research Triangle Park
North Carolina 27711

Assigned to: School of Chemical Engineering

COPIES TO:

- Principal Investigator
- School Director
- Dean of the College
- Director, Research Administration
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- Photographic Laboratory
- Project File
- Other

RA-3 (6-71)

GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION

SPONSORED PROJECT TERMINATION

Date: March 18, 1977

Project Title: *Georgia Tech Air Quality Control Training Program*

Project No: *E-19-546*

Project Director: *Dr. Clyde Orr*

Sponsor: *Environmental Protection Agency*

Effective Termination Date: *6/30/76*

Clearance of Accounting Charges: *6/30/76*

Grant/Contract Closeout Actions Remaining: *NONE*

- _ Final Invoice and Closing Documents
- _ Final Fiscal Report
- _ Final Report of Inventions
- _ Govt. Property Inventory & Related Certificate
- _ Classified Material Certificate
- _ Other _____

Assigned to: *Chemical Engineering* (School/Laboratory)

COPIES TO:

- Project Director
- Division Chief (EES)
- School/Laboratory Director
- Dean/Director—EES
- Accounting Office
- Procurement Office
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- Reports Coordinator (OCA)
- Library, Technical Reports Section
- Office of Computing Services
- Director, Physical Plant
- EES Information Office
- Project File (OCA)
- Project Code (GTRI)
- Other _____

CA—4 (3/76)

GEORGIA INSTITUTE OF TECHNOLOGY
ATLANTA, GEORGIA 30332

SCHOOL OF
CHEMICAL ENGINEERING

August 23, 1976

Mr. Robert V. Paul, Chief
Special Projects and Control Section
Grants Operational Branch
Grants Administration Division (PM-216)
United States Environmental Protection
Agency
Washington, D. C. 20460

Dear Mr. Paul,

Reference: Grant No. T-900499

Attached is a Final Technical Report covering the referenced grant which ended June 30, 1976. Should you require additional information, please contact me at this address or call

404-894-2876

Financial Status Report, Report of Inventions, and Equipment Inventory are being sent separately.

Sincerely yours,

Michael J. Matteson
Associate Professor

MJM:jps

cc

Enclosures

FINAL REPORT
THE GEORGIA TECH AIR QUALITY
TRAINING PROGRAM

Brief History

Beginning in the Fall Quarter, 1969, a multidisciplinary faculty group interested in atmospheric environmental pollution and its abatement was recognized by the Administration of the Georgia Institute of Technology and designated "The Committee on Air Quality Control Training". This committee is chaired by Dr. Clyde Orr, Jr., Regent's Professor, and Dr. Matteson serves as co-chairman. Other members of the committee are Professor Richard King, C.E.; Professor Thomas Kethley, Biol.; Dr. Peter Sturrock, Chemistry; and Dr. C.G. Justus, Aerospace Engineering.

The purpose of this committee is to develop, establish and coordinate a core curriculum offering a specialization in Air Quality Control to students pursuing the Master of Science Degree. This specialization, or minor, is distributed currently over the fields of Chemistry, Chemical Engineering, Civil Engineering, Biology, and Meteorology. The choice of courses from the Air Quality Control Training core curriculum are made by the respective schools so that at least 13 quarter hours credit in core courses are integrated within the other course requirements of the schools. Also required for the M.S. Degree is a thesis on a topic related to air quality control. See Table 1 for an example curriculum.

Committee activities during the formation of this training program included the development and instruction of air pollution courses within the various schools, the preparation of a major Training Grant Proposal to the Environmental Protection Agency, the recruitment of qualified students for the training program, and the overall coordination of the training activities. The training grant proposal was funded by the EPA for a four year period, which began July 1, 1970. EPA

funding provided for staff support, equipment and supplies, and student traineeships, for a total of $344,012. The project period was eventually extended to June 30, 1976.

Courses in the Training Program

In order to provide a core curriculum in the air quality field certain new courses were developed. These are as follows:

1. Ch.E. 6610 Aerosol Technology (3 cr)

The purpose of this course is to present basic concepts describing the behavior of dispersed particles, both natural and man-made, in air. Topics covered include the formation of aerosols by condensation and dispersion techniques; particle size analyses; diffusion, coagulation and settling; kinetics and dynamics of small particles; collection and sampling via filtration, precipitation and elutriation; electrostatic and optical properties; and lung deposition.

2. Ch.E. 6611 Industrial Emissions Control (3 cr)

Analysis of air pollution sources and their control by substitution and process change is to be stressed. Recovery and utilization of waste gaseous and particulate matter is also to be covered. Control technology and equipment to be discussed will include scrubbing, filtration, precipitation absorption, adsorption and catalytic conversion methods. Low cost equipment for small industry is also considered.

3. Ch.E. 6612 Atmospheric Reactions (3 cr)

The principles of atmospheric reactions, including primary and derived air pollutants, atmospheric assimilation and removal, formation of intermediate reaction products and free radicals, photochemical and photosensitized reactions, heterogeneous reactions, air ions are covered. Reactions of specific air pollutants -- SO_2, NO_x and organics -- are stressed.

4. Chem. 5201 Analysis of Atmospheric Contaminants (3 cr)

This course is intended to acquaint the student with modern analytical techniques and instrumental methods. It includes applications involving the measurement of air contaminants. Topics include volumetric and titration techniques; solvent extraction; UV, IR and visible spectrophotometry; spectrofluorimetry and nephelometry; emission spectroscopy and flame emission; atomic adsorption and mass spectrometry; ESR and NMR; X-Ray methods; radiochemical techniques; chromatography; and electrochemical methods.

5. Bio. 6635 Air Pollution Biology (3 cr)

This is a course designed to acquaint engineers and scientists with the biological aspects of air pollution. Air pollution is considered as one factor in the total environment of living systems. Animals and plants are examined as receptors of air contaminants, as indicators of the effects of air pollution, and also as sources of air pollution. Airborne micro-organisms are considered as air pollutants and their sources, distribution, and effects are examined.

6. A.E. 6302 Air Pollution Meteorology (3 cr)

The principal aspects of meteorology as they pertain to the emission, diffusion and dispersion of air pollutants are discussed. Mathematical methods are presented to predict plume characteristics and fallout as a function of meteorological and topographical parameters. Meteorological data gathering and sampling procedures are demonstrated as they pertain to stack design and site location.

7. C.E. 6124 Air Pollution, Measurements and Control (4 cr)

Analyzed are the air pollution problems of cities and industries; methods of evaluation the problems; the description, design and use of air sampling equipment; and methods for control of air pollutants.

These core courses were then integrated into a program where, together with certain support courses, they comprise the Air Quality Control Training Program. Divided into topical areas, the following courses are available:

Area 1. Air Pollution Sources and Control

Major Courses:	Ch.E.	6610	Aerosol Technology	3-0-3
	Ch.E.	6611	Industrial Emissions Control	3-0-3
	C.E.	6124	Air Pollution, Measurement and Control	3-3-4
Support Courses:	Ch.E.	4414	Air Pollution Control	3-0-3
	A.E.	6304	Aerospace Systems and the Environment	
	Biol.	4413	Air and Water Pollution	3-0-3
	C.E.	4133	Engineering Aspects of Environmental Health	3-0-3
	M.E.	4320	Internal Combustion Engines	3-3-4
	M.E.	4322	Power Plant Engineering	3-3-4
	N.E.	4620	Nuclear Technology and the Environment	3-0-3

Area 2. Diffusion, Dispersion, and Atmospheric Reactions

Major Courses:	Ch.E.	6612	Atmospheric Reactions	3-0-3
	A.E.	6302	Air Pollution Meteorology	3-0-3
Support Courses:	A.E.	6303	Atmospheric Boundary Layer	3-0-3

Area 3. Effects of Air Pollutants

Major Courses:	Biol.	6635	Air Pollution Biology	3-0-3

Area 4. Sampling and Analysis of Air Pollutants

Major Courses:	Chem.	5201	Analysis of Atmospheric Contaminants	3-0-3
	C.E.	6134	Analytical Methods for Air Pollution Studies	3-3-4

Area 5. Air Quality Management

Major Courses:	C.E.	6368	Applied Environmental Resources Management	1-4-3
	I.Sy.E.	4726	Engineering Economic Analysis in the Public Sector	
Support Courses:	C.E.	6353	Economic and Financial Aspects of Public Works Planning	3-0-3
	C.P.	6140 6150	Environmental Aspects of City and Regional Planning I, II	3-0-3
	I.Sy.E.	3025	Engineering Economy	3-0-3
	I.Sy.E.	3033	Deterministic Models in Operations Research	4-0-4
	I.Sy.E.	4044	Simulation	2-3-3

Recruitment of Qualified Students

A brochure was prepared and distributed annually to universities and colleges with engineering and science programs, describing the Georgia Tech Air Quality Training Program, qualifications for stipend support, and the procedure for enrollment in the program.

Lectures were presented at the undergraduate level to incoming freshmen and sophomores on the choice of air quality control as a career and the program available at Georgia Tech. During events such as Environmental Concern Week, students were informed of courses and options available in air pollution training. Local newspapers have also carried articles announcing the program.

Dr. Matteson has paid frequent visits to the Region IV EPA, Georgia State

Health Department, Fulton and DeKalb County Health Departments, and their respective Air Quality Control branches, so that personnel working in these agencies are made aware of the program. Night classes in air quality control were offered so that more people from local government agencies may participate. Lectures have also been presented to concerned civic groups and professional society meetings describing the program.

Visiting Senior Foreign Scientist

In 1970 the School of Chemical Engineering at Georgia Tech nominated Professor Othmar Preining of the University of Vienna as a candidate for the National Science Foundation Senior Scientist Fellowship competition. The purpose of these awards is to bring to the United States foreign scientists whose formal training, teaching and research experience are of sufficient distinction to enable them to make significant contributions to education and research at American Universities.

Professor Preining is a noted international physicist in the field of aerosols and air pollution research. He was awarded the fellowship and began his visit at Tech in the Fall of 1971.

Dr. Preining instructed the Aerosol Technology Course both Fall and Spring Quarters 1971-72. Students from at least six major disciplines were enrolled in these courses including Biology, Physics, Chemistry, Mechanical, Nuclear and Chemical Engineering. The subject matter was well received and many ideas were generated to assist the students in their particular research efforts.

Students from Atlanta U. Supported by Training Grant

The Georgia Tech Training Committee arranged with the EPA for support of qualified graduate students from Atlanta University to enroll in the Georgia Tech Air Quality Training Program. These students completed their M.S. degree at Atlanta U. while simultaneously fulfilling the course requirements for the

minor in Air Pollution Control at Tech. Seven students completed the program. One of these graduates was selected to establish a similar cooperative program at Shaw College in affiliation with North Carolina State University.

Progress at the End of Sixth Year of Training Program

The Air Quality Control Training Program at Georgia Tech has attracted a large number of student participants over the past six years, and has provided a significant number of trainee graduates for professional employment with industrial and government air pollution control agencies. Table 2 is a summary of those students with degrees earned, thesis titles, and current activity, who were supported by the training grant. The composition of graduated trainees, by discipline, is: Aerospace Engineers 7%, Biologists 21%, Chemists 7%, Chemical Engineers 38%, Mechanical Engineers 12%, and Physicists 10%.

By bringing together students from a variety of disciplines the problems associated with air pollution were approached from several viewpoints. The students were motivated both through assignments and joint projects to present, orally and in writing, their findings on specific tasks. This served to give the engineers a better understanding of how the biologist, chemist, or physicist looks at a problem and vice versa.

A strong effort was made throughout the courses of instruction to put the material on as practical a basis as possible, while still maintaining the level of excellence expected of graduate students. Stack sampling equipment was displayed and demonstrated, and particle size analyses were performed on locally discharged pollutants. Training aids obtained from EPA such as handbooks, workbooks, pamphlets, slides and films were integrated into the training program and utilized whenever practicable.

The classes attended pertinent lectures at Georgia Tech, and in the Atlanta area, presented by prominent invited speakers on air pollution related topics.

The training program found acceptance among a wide sector of the student body, since it was not restricted to those being supported by the EPA, but, open to qualified graduate students and senior level students upon permission of the instructor. In response to requests for a senior level air pollution course, Dr. Matteson initiated Ch.E. 4414 in the Spring of 1973. This course applies mass transfer principles to the design of pollution, control systems utilizing adsorption, absorption, filtration and precipitation.

Table 3 presents the course offerings in the training program over the past six years with enrollment figures. The total enrollment over the past six years is 781. Of this number 168 represents enrollment by EPA supported trainees. This may be interpreted to mean that over 75% of the enrollment was composed of students who elected to study air quality, not because of stipend requirements, but out of their own interest in this field.

During the 1972-73 academic year the undesignated degree Master of Engineering (Science) program was established, allowing amore comprehensive curriculum in the specialization of Air Quality Control. The courses available are presented on pages 3 and 4, and a sample program, in Table 1A. With this approach the student has a much greater opportunity to supplement the core courses with related air pollution courses. It also allows the M.S. candidate to pick up needed background in air quality management.

We have emphasized recruitment of employees from state and local agencies. Table 4 cites a number of trainees who have taken air pollution training at Tech in order to improve their proficiency in their work with various air quality control agencies.

Students are now encouraged to take a greater number of courses dealing with the control aspects of air pollution. These are outlined on page 3. More emphasis is now given to laboratory experience in connection with the courses.

In 1974 a certificate was prepared and is awarded to those graduate students fulfilling the requirements of the training program. A copy of this certificate is attached. The certificate is signed by the Dean of the College of Engineering and the Director of the Air Quality Training Program.

Current and Future Enrollment and Support

Current enrollment figures indicate a continued interest in the training program, even though traineeships are no longer available. We expect, for Fall Quarter, 1976, to enroll about the same number of students in Ch.E. 6610, 6611 and C.E. 6124 as were enrolled in Fall 1975.

The area hardest hit by the termination of the training grant is funding for graduate research in air pollution control. Funds available through research contracts and grants are not replacing those lost via training grants. Georgia Tech receives no EPA air pollution research contracts or grant funds. Because of this, faculty must develop interest in other fields. This is a handicap to the development of the courses in Aerosol Technology, Atmospheric Chemistry, and Air Pollution Control.

TABLE 1

Example Schedule for a Chemical Engineering candidate for the M.S. degree with specialization in Air Quality Control.

Fall			
Ch.E.	6601	Thermodynamics I	3-0-3
Ch.E.	6615	Transport Phenomena I	3-0-3
Ch.E.	6619	Ch.E. Calculations I	3-0-3
Ch.E.	6610	Aerosol Technology	3-0-3
Ch.E.	8001	Seminar	1-0-1
			12
Winter			
Ch.E.	6602	Thermodynamics II	3-0-3
Ch.E.	6616	Transport Phenomena II	3-0-3
Ch.E.	6611	Industrial Emission Control	3-0-3
Ch.E.	6612	Atmospheric Reactions	3-0-3
A.E.	6302	Air Pollution Meteorology	3-0-3
Ch.E.	8002	Seminar	1-0-0
Ch.E.	7000	Thesis	0-2-2
			17
Spring			
Ch.E.	7000	Thesis	0-6-6
Chem.	5201	Analysis of Atmospheric Contaminants	3-0-3
Biol.	6635	Air Pollution Biology	3-0-3
Ch.E.	8003	Seminar	1-0-0
			12
Summer			
Ch.E.	7000	Thesis	0-9-9
			9
		TOTAL	50

TABLE 1A

Example Schedule for a candidate for the undesignated M.S. Degree with specialization in Air Quality Control.

Fall			
Ch.E.	6610	Aerosol Technology	3-0-3
C.E.	6124	Air Pollution Mgt. and Control	3-3-4
I.Sy.E.	4044	Similation	2-3-3
M.E.	4327	Combustion & Flames	3-0-3
Ch.E.	8001	Seminar	1-0-0
			13
Winter			
Ch.E.	6611	Industrial Emission Control	3-0-3
Ch.E.	6612	Atmospheric Chem. Reactions	3-0-3
C.E.	6368	Applied Environ. Resources Mgt.	1-4-3
Biol.	6635	Air Pollution Biology	3-0-3
A.E.	6302	Air Pollution Meteorology	3-0-3
Ch.E.	8002	Seminar	1-0-0
			15
Spring			
Chem.	5201	Analysis of Atmospheric Contaminants	3-0-3
C.P.	6140	Environmental Aspects of City and Regional Planning	3-0-3
Ch.E.	7000	Thesis	0-6-6
			12
Summer			
Ch.E.	7000	Thesis	0-11-11
			11
		TOTAL	51

TABLE 2

Students Supported by EPA Training Grant in Air Quality Control

Trainees Enrolled

Trainee School Grad. Date	Period of Traineeship	Dollar Support Stipend	 Tuition	Thesis Title	Current Activity/Employment
Basile, Frank J. ME 12/8/73	7/72-6/73	4,000	1,892	A Model of Closing Volume in the Human Lung	Engineer, industry *
Baskerville, Jesse CHEM 12/8/72	7/71-6/72	3,875	672	Adsorption of Atmospheric Trace Gases on Natural Graphite	EPA, Atlanta *
Blackshaw, Andrew L. ME 12/8/73	7/72-6/73	3,500	712	A Study of an Air-Cooled, Propane Powered Wankel Engine	Project Engineer, Hoechst Fibers
Blackstone, Michael M.	10/71-11/71	500	403		Withdrew
Bock, Eddie B. ChE 12/6/75	1/72-12/72	3,500	1,682	Aerocolloid Formation From Material Under Irradiation	Engineer, industry *
Boscoe, George F. ChE 12/9/73	10/71-9/72	3,500	1,682	Density Distributions in Aerosols Formed by Condensation	Engineer, Standard Oil Company *
Bulpitt, William S. ME 12/8/71	1/71-12/71	3,000	1,606	A Comparison Study of the Exhaust Emissions of a Wankel Engine Using Gasoline and Natural Gas as Fuels	Project Engineer, U. S. Air Force
Church, John C.	1/71-3/71	875	400		Withdrew
Churchman, Charles	7/71-9/71	750			Did not remain on Grant
Collins, Frank A. IM 3/15/72	10/70-9/71	3,000	672	State Inspection of Automobiles to Monitor the Performance of Exhaust Gas Emission Control Systems	Engineer, EPA * North Carolina
Cronk, Robert N. IM	7/72-6/73	4,000	712	Thesis not complete	Did not complete program State Air Poll.Cont.Agcy.
Davis, Joel L. PHYSICS 3/15/72	1/71-12/71	3,125	672	Absorption of Sulfur Dioxide by Charged Qaueous Droplets	Ph.D. Candidate in Physics at Georgia Tech
Dennis, Ronald M. ChE 12/6/75	4/73-3/75	3,000	1,902	The Collection of Uniform Latex Aerosol Particles by Charged Water	State of Georgia Air Pollution Control
Dodge, L. G. PHYSICS 3/21/73	10/71-9/72	3,000	1,682	Optical Methods for the Detection of Nitrogen Oxide as a Pollutant	Physicist
Drake, Dennis M.	9/72-8/73	3,000	1,892	Did not complete thesis	Engineer, State Cov't. * Michigan Air Poll.Cont.Pgm

* Job deals directly with air pollution abatement

Students Supported by EPA Training Grant in Air Quality Control

Trainee School Grad. Date	Period of Traineeship	Dollar Support Stipend	 Tuition	Thesis Title	Current Activity/Employment
Duncan, Jeffrey L. ChE 6/11/75	4/74-3/75	3,000	1,902	Atmospheric Pollutants and Their Effects on Corrosion	Project Engineer, Exxon *
Ellison, Thomas W.	7/72-8/72	583	473		Withdrew from program
Finley, Craig W. BIOL 9/13/73	9/72-8/73	3,834	1,419	Effects of Environmentally-Induced Anoxia on the Development of In-utero Rat Embroyos	Engineer, Academic
Fitzpatrick, Shelton BIOL 9/13/73	9/72-8/73	4,751	1,419	Influence of Ambient Carbon Monoxide on the Rate of Development of Dutch Elm Disease	Ph.D. Candidate, Biology
Fortune, Maurice P.	10/71-9/72	3,125	1,682		Did not complete program
Fritchman, Doris BIOL 9/6/71	10/70-8/71	3,000	1,332	A Study of the Lichen Distribution on Selected Trees in Western Metropolitan Atlanta as Influenced by the City Environment	Secondary Education, Germany, U.S. Forces
Giardina, Philip J. ChE 3/21/73	1/72-12/72	3,000	1,682	The Effects of Humidity and Gas Phase Concentration on the Absorption of Sulfur Dioxide by Charged Aqueous Droplets	Engineer, Proctor & Gamble *
Glass, Sherman J. ChE 9/30/72	10/71-9/72	4,000	1,682	Ion Enrichment in Aerosols Generated by Bursting Bubbles	Process Engineer, Exxon Corp. *
Hargraves, William R. AE 12/6/75	10/74-9/75	3,000	1,912	Wind Energy with Emphasis on Reduced Air Pollution	Engineering Consulting
Hatfield, John A. ChE 3/17/76	10/74-9/75	3,000	1,912	Adsorption of Sulfur Dioxide by Activated Peanut Shell Charcoal	Pharmaceutical Co., Albany, GA
Hermann, John P. ChE 12/6/76	10/75-6/76	2,500	1,434	The Absorption of NO_2 by Water Droplets During Condensation	Student, ChE GA Tech
Jones, Arthur J. BIOL 6/13/73	7/72-6/73	4,500	1,682	The Distribution of Soil Fungi in an Urban Environment	Ph.D. Candidate, Biology Purdue
Lambert, Loretta M.	9/73-6/74	2,500	1,419		Did not complete program
Lewis, Lonzy PHYSICS 12/8/73	1/72-12/72	3,000	692	The Scavenging of Aerosols by Electrically Charged Water Droplets	Graduate Student Ph.D. Candidate
Martin, Louis J. ChE 9/06/76	10/74-9/75	3,000	732	The Effects of Aerosol and Oxygen Concentration on Corrosion of Metals by Various Pollutants	Union Carbide, Charleston, W. VA
Moore, David W. ChE 12/9/72	6/71-12/72	3,250	1,682	Diffusion in the Presence of Sedimentation	Chevron Oil, Bakersfield, CA

* Job deals directly with air pollution abatement

Students Supported by EPA Training Grant in Air Quality Control

Trainee School Grad. Date	Period of Traineeship	Dollar Support Stipend	 Tuition	Thesis Title	Current Activity/Employment
Morris, James S. ME 8/31/74	1/73-2/74	3,000	702	Interferometric Method for the Simultaneous Measurement of Heat and Mass Transfer	Unknown
Neal, Randall A. BIOL 9/6/71	10/70-8/71	3,658	1,200	A Study of the Lichen Distribution on Selected Trees in Eastern Metropolitan Atlanta as Influenced by the City Environment	EPA, N. C. *
Oliver, Manuel J. ChE 6/10/76	1/75-12/75	3,000	1,912	The Absorption of Oxygen by Water Droplets During Condensation	Ronrico Rum, Puerto Rico
Patterson, Ralph A. PHYSICS 6/13/73	4/72-3/73	4,000	702	The Analysis of Gaseous Mixtures Via Microwave Line Intensity Measurements	Unknown
Pendergrass, Levester BIOL 6/7/72	7/71-6/72	4,000	1,612	Myxomycetes from Bark of Living Tree in Panola Mt. State Park -- Environmental Effects	Ph.D. Candidate, Biology Atlanta U.
Robertson, Donald B. ChE 3/17/76	10/74-9/75	3,000	732	Ferric Hydrous Oxide Sols of Narrow Size Distribution	Pollution Control Consulting
Salters, Charles R. BIOL 9/30/72	9/71-8/73	3,500	1,209	Distribution of Lichens on Trees Along Transect Lines in the Landing Approach to the Atlanta Airport	Biology Instructor, Morgan State College, Baltimore, MD.
Sandlin, Carl W. ChE 12/9/72	10/71-9/72	3,000	1,612	Diffusion of Aerosols at Various Temperatures	Project Engineer, Exxon, Corp. *
Schroeder, Arthur J. ChE 6/10/76	1/75-12/75	3,000	732	Adsorption of Sulfur Dioxide on Activated Peanut Shell Charcoal at Various Temperatures	Amoco, Lake Charles, LA.
Shackelford, William G.	10/71-10/71	292	403		Withdrew
Stansfield, John M. AE 6/10/76	3/75-2/76	3,000	1,912	Energy Dissipation in Atmospheric Flow	Seeking employment
Swartz, Randy S. ME 12/9/72	1/72-12/72	3,500	1,209	Reducing Emissions From a Natural Gas Powered Wankel Engine	Mech. Engineer, E. I. Dupont *
Tice, John J. CHEM 8/30/72	10/71-6/72	2,500	1,209	Trace Analysis of Some Heavy Metals in the Presence of Phosphate and Arsenic	Chemist, Ph.D. Candidate GA Tech
Wiedl, Stephen C. BIOL 12/10/76	10/74-9/75	3,000	732	Effects on Development of Plant Communities by Aircraft Jet Exhaust	Due to graduate, Biology Georgia Tech
Wills, Thomas L. ChE 3/17/76	9/73-8/74	3,000	1,892	The Absorption of Sulfur Dioxide by Water Droplets during Condensation	Engineer, Standard Oil Company * CA
Yingst, John G. AE 3/20/77	10/74-9/75	3,000	732	Meteorological Site Selection for Nuclear Power Plant	Engineering Consulting

TABLE 3

Course Offerings in the Air Quality Training Program

	Course		Enrollment					
			1970/71	1971/72	1972/73	1973/74	1974/75	1975/76
Fall								
Ch.E.	6610	Aerosol Technology	16	21	17	12	10	--
Ch.E.	6611	Industrial Emissions Control	--	--	--	--	15	15
C. E.	6124	Air Pollution Measurements and Control	15	28	14	13	21	9
Winter								
Ch.E.	6611	Industrial Emissions Control	19	18	19	9	--	--
Ch.E.	6612	Atmospheric Chemical Reactions	23	13	13	8	18	11
Ch.E.	6613	Particle Technology	10	10	7	4	3	
A.E.	6302	Air Pollution Meteorology	--	13	11	15	13	17
Spring								
Ch.E.	4414	Air Pollution Control	--	--	17	18	25	20
Ch.E.	6610	Aerosol Technology	7	5	7	6	7	11
Ch.E.	6611	Industrial Emissions Control	8	18	9	--	--	--
Ch.E.	6613	Particle Technology	--	--	--	--	--	11
Chem.	5201	Analysis of Atmospheric Contaminants	13	11	15	8	10	--
Biol.	6635	Air Pollution Biology	18	23	20	15	12	7
		Totals	129	160	149	108	134	101

TABLE 4

TRAINING OF STUDENTS TO MEET MANPOWER REQUIREMENTS IN FEDERAL, STATE AND LOCAL AIR QUALITY CONTROL AGENCIES

Several students have registered in the training program to further their background in air pollution control so they may return to their respective agencies better equipped to deal with practical control problems. The following are specifically cited:

Mr. Marvin Lowry has been with the State of Georgia Department of Public Health, Air Pollution Control Service since 1965. After educational leave he became Director of the Air Pollution Control Service upon completion of the training program.

Mr. Holmes Pyles, an industrial hygienist with the State of Georgia Department of Public Health, also on educational leave, returned upon completing the program.

Mr. William Miller was an employee of the City of Philadelphia, Air Management Services, Engineering Division, as a Public Health Engineer since June, 1968, and was promoted to head the Permits and Plans Section for Air Pollution Control Equipment before returning to school. He resumed duties in this area when he completed his M.S. degree in Sanitary Engineering.

Mr. James Fletcher worked with the Air Pollution Control Section of the Fulton County Health Department, conducting basic chemical sampling and analysis and emissions inventories. He plans to apply for employment at the Federal level upon completion of his degree requirements.

Mr. Frank Collins has served in the Commissioned Corps of the U.S. Public Health Service since 1968 at the National Air Pollution Control Administration, Division of Economic Effects Research, where his principal duties included estimation of costs of control equipment for mobile sources of pollution. He

has resumed work at the federal level upon completing his M.S. degree in Industrial Engineering.

Mr. Dennis Drake was an employee of the State of Michigan, Department of Natural Resources, Divison of Air Pollution Control until Fall of 1972, when he enrolled in the Tech Air Quality Training Program. He since has returned to duties with the State of Michigan.

Mr. Robert Cronk worked summers, as an undergraduate at Tech, with the Air Quality Control Branch, Georgia Department of Health. After completing graduate work in Air Quality Control, he has joined the State Branch on a full time basis.

Mr. Roy Segars and Mr. Jesse Baskerville are recent (1973) M.S. graduates in Ch.E. and Chemistry, who have participated in the Tech Training Program, and are now with EPA Region IV, Atlanta.

Mr. James Hare and Mr. Bill Mitchell took educational leave from the State of Georgia Air Quality Control and completed training in the 1973-74 year. Mr. Tom Teston was on educational leave during 1974-75.

Mr. Raoul Mendez formerly worked as a chemist in the Air Pollution Laboratory of the Department of Health of the Commonwealth of Puerto Rico and is now undergoing Air Quality Training at Georgia Tech.

Mrs. Diane Carlson, supported by an EPA Fellowship, completed her M.S. in Ch.E. and her training in Air Pollution Control Technology at Tech in 1974-75. She has returned to duties with the State of Michigan Air Pollution Control Branch.

Ms. Sue Robertson is currently on leave from the State of Alabama Air Pollution Control Agency, while pursuing her graduate studies in Ch.E. and Air Pollution Control at Georgia Tech.

Several other students in the program have indicated interest in entering a career in the air quality control field and have submitted applications to various agencies.